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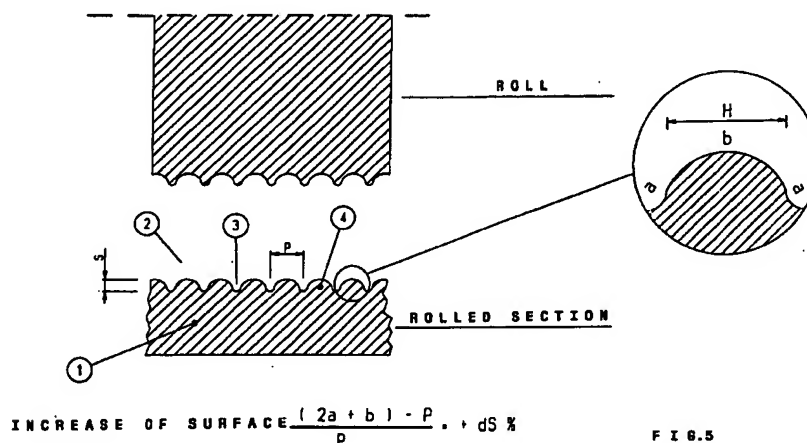
(54) Rolled section for the realization of heat exchangers and relevant production method

(57) A rolled section (1) for the production of heat exchangers, and in particular for the production of micro-fins (4) to be used in this kind of apparatus, that presents on one or both sides a series of scoring suitable to determine the same number of micro-fins (4) so as to increase the width of the corresponding exchange surface between rolled section and fluid. The process for the production of rolled sections is including the steps of:

- rolling a metallic sheet to obtain the required thick-

ness

- rolling afterwards the sheet obtained in this way by means of a rolling-mill where at least one of these rolls presents on the surface a series of engraving suitable to engrave the corresponding surface of the rolled section in order to produce said micro-fins, the surface of said roll of the second rolling-mill being worked by means of photogravure techniques.



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## Description

This invention proposes a rolled section, in particular a metallic rolled section, for instance copper, aluminum or similar, for the realization of heat exchangers and in particular for the realization of little fins to be used in this kind of apparatuses.

The rolled section according to the invention presents, on one or both sides, a series of scoring or micro-fins which determine a considerable increase of the exchange surface without for this reason affecting the total size of the exchanger.

Rolled sections according to the invention can be applied in a particularly advantageous way if they are used for the production of the little fins used by exchangers, but it is clear that the invention is not limited to this specific use and includes also the use of such rolled sections for the realization of tubes, ducts, walls and all parts in general that form a heat exchanger.

The invention concerns also the method for the production of these rolled sections.

It is known that the efficiency of heat exchangers is a function, among other things, also of the extension of the contact surface between the exchanger and the fluid that cedes or absorbs the heat.

For this reason, the exchanger body, that can be formed by a tube, a coil, a wall or similar, is generally provided with a plurality of little fins which, increasing the contact surface between the exchanger and the fluid that cedes or absorbs the heat, increases its efficiency.

One of the problems common to all users of exchangers is the reduction as far as possible of the apparatus size, for obvious reasons of practicality.

One of the most common examples is for instance the advantage deriving from the possibility to reduce the size of exchangers for air conditioners used in houses, or for car radiators etc., where the possibility to save space offers certain and noticeable advantages.

Many studies were made with reference to systems in order to improve the efficiency of these exchangers, studies that induced to fix the optimal density of the little fins, the best materials with which to realize the exchanger, and the possible treatments, as for instance painting with hydrophile paint or similar. All these treatments were directed to obtain an effective exchange with an apparatus having little size.

The apparatuses themselves are susceptible of further improvement and this invention is intended as added to this sector. The invention proposes a rolled section for the realization of heat exchangers that is characterized by the fact that it provides, on one or both surfaces, a series of scoring or micro-fins, suitable to noticeably increase the exchange surface with the refrigerating or heating fluid.

This invention is now described in details, with reference to the enclosed figures, where

- figures 1 and 2 are a view, at microscope, of the

surface of a rolled section according to the invention;

- figures 3 and 4 are photographs at microscope of the rolled section according to the invention, taken in cross-section with two different scales, so as to emphasize the little fin profile obtained in the surface;
- figure 5 is a drawing that illustrates, in a schematic way and in section, a rolled section according to the invention

With reference to figure 5, with number 1 a rolled section according to the invention is shown, that presents, on at least one of the surfaces, in the specific case on the upper surface 2, a series of grooves 3 which produce the same number of parts in relief or micro-fins 4.

The extension of the surface of the upper side of section 1, thanks to the presence of the undulations, is much bigger than the lower surface and it depends from the width, from the form and from the height of these micro-fins 4.

With micro-fins with a substantially semicircular shape, the upper surface of the panel is about 1.7 times the lower surface; changing appropriately the height and the configuration of the little-fins, it is therefore easy to double the width of the surface in contact with a refrigerating or heating fluid.

The invention concerns also a process for the production of rolled sections that provides the following steps:

- to produce a rolled section having the required thickness by means of known rolling techniques, preferably by means of a rolling-mill;
- to submit the rolled section obtained in this way to a further step of rolling by means of a rolling-mill where at least one of the rolls presents a scored surface so as to realize on the surface of the plate submitted to processing the required series of little fins.

The roll or rolls of the second rolling-mill could be produced with the technique of photogravure, realizing the drawing of the scoring on a support that is then applied onto the surface of the roll. This surface is then treated with an acid in appropriate concentration and for a predetermined period of time, so as to realize engraving having the needed depth.

As above described, the form and size of the little fins could vary within wide limits, in function of the material to be treated and of the required result.

From a series of tests made by the applicant it came out that good results can be obtained engraving the surface of the rolled section so as to obtain a series

of little fins or reliefs having a width H (figure 5) of about 40 micron and a height of about 23 micron.

Aluminium rolled sections were produced having a thickness of about 0,30 mm and presenting a scored surface with little fins with the above specified size.

The surface of one of these sections is illustrated in the photographs taken at the microscope and reproduced in figures 1 to 4.

In case of use for the realization of little fins, the rolled sections could present one or both scored surfaces with micro-fins, while in other cases, for instance when the rolled section is used for the production of tubes or other components of an exchanger, a surface, for instance the inner one, could be smooth and the micro-fins could be provided only on the outer surface in contact with air.

The rolled sections according to the invention, thanks to the above described characteristics, allow the reduction, at the same efficiency rate, of the size of the exchanger or the noticeable improvement of its characteristics without increasing the volume.

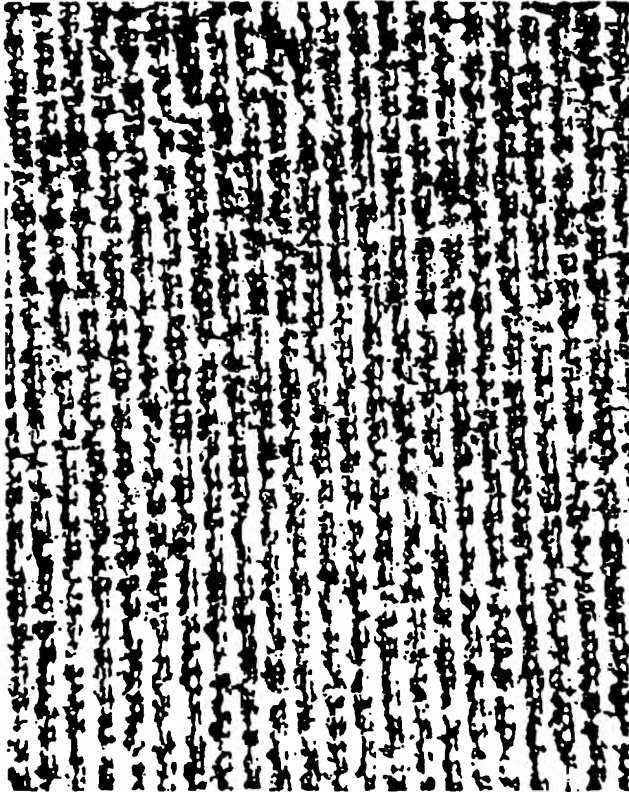
An expert in this field could then foresee many changes and variations, that however should be considered all included in the scope of this invention.

#### Claims

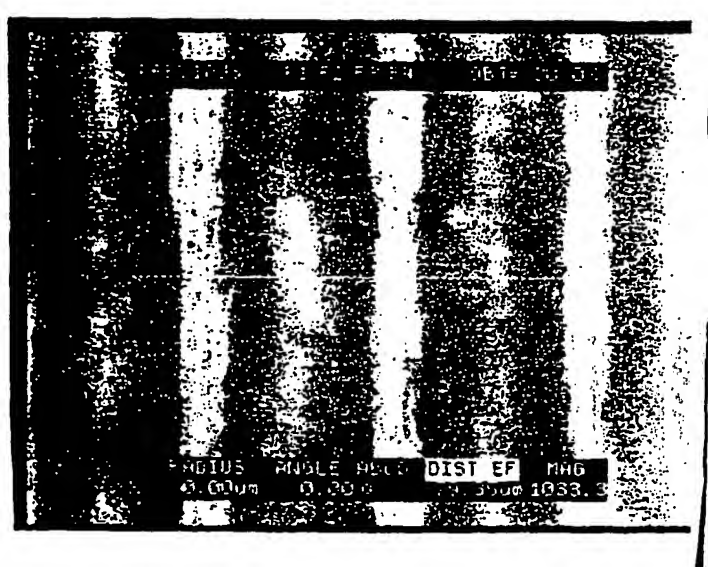
1. Rolled sections for the realization of heat exchanger, characterized by the fact that they provide on at least one of the surfaces a series of scoring suitable to cause the same number of micro-fins so as to increase the width of the corresponding exchange surface between rolled section and fluid.
2. Rolled sections according to claim 1, characterized by the fact that said micro-fins have size (length and height) 9 to 200 micron.
3. Rolled sections according to claim 2, characterized by the fact that said micro-fins have a width 36 to 60 micron and an height 10 to 30 micron.
4. Rolled sections according to claims 1 or 2, characterized by the fact that they are formed by a metallic sheet, on at least one of the surfaces of which a plurality of scoring are engraved, suitable to cause the same number of reliefs or micro-fins on said surface.
5. Use of rolled sections according to claims 1 to 4, for the production of heat exchanger devices.
6. Use of rolling sections according to claim 5, for the production of refrigerating little fins to be used in heat exchanger devices.
7. Process for the production of rolled sections according to one of the previous claims, character-

ized by the fact that it provides the following steps:

- rolling of a metallic sheet to obtain the required thickness
  - further rolling of the sheet obtained in this way by means of a rolling-mill where at least one of the rolls presents on the surface a series of engraving suitable to engrave the corresponding surface of the rolled section in order to produce said micro-fins
8. Process according to claim 7 and 8, where the surface of said roll of the second rolling- mill is worked by means of the techniques of photogravure.



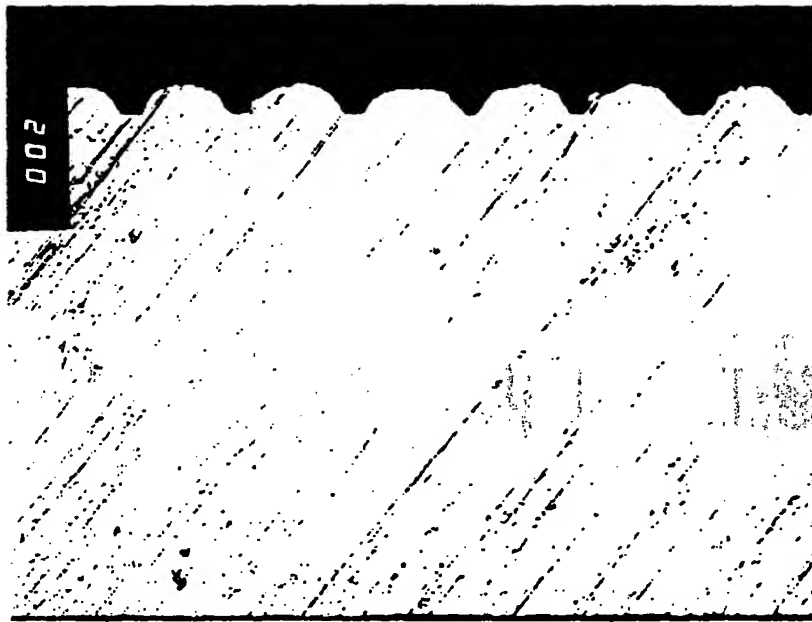
F I G. 1



F I G. 2



F I G . 3



F I G. 4



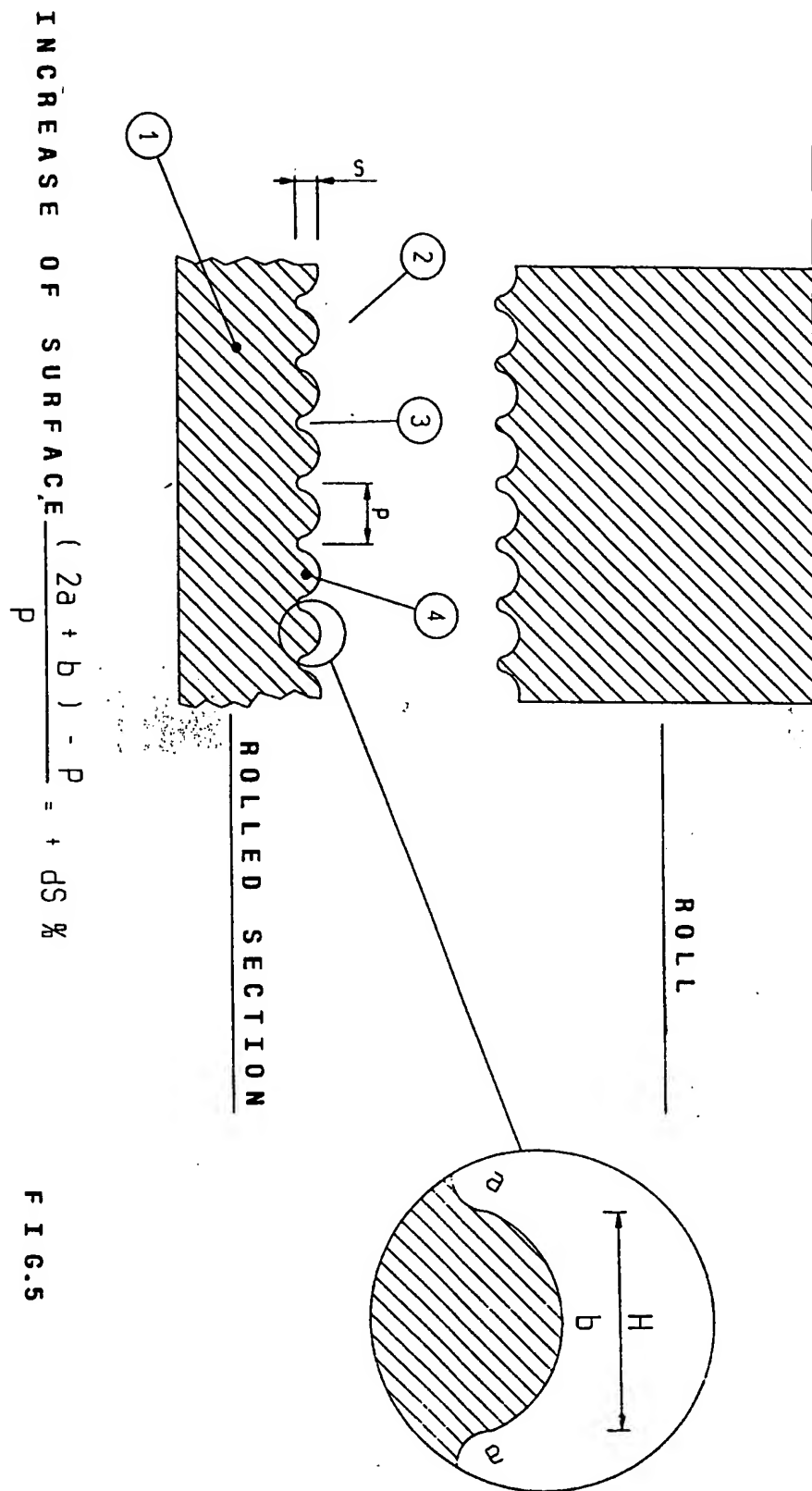


FIG.5